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Advancing Coordination Between DRM And CCA In Integrated Flood Risk Management

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ABSTRACT: Flood hazards in coastal regions induce risks toward lives, property, economy and the environment. In need of sustainable and holistic actions to reduce risks, these should include innovative Disaster Risk Management (DRM) and Climate Change Adaptation (CCA) measures. While differing on important parameters such as political commitment, awareness and uncertainty of the hazard/risk, commonalities between DRM and CCA can also be identified that affect human settlement, institutional adaptation, and the economy. This supports coordination of mitigation and adaptation measures to create resilience and sustainable solutions that take into account present and future outcomes. Adaptation must be integrated in existing policy making and be a planning process priority to become effective, however. In relation to coastal hazards in Denmark, deficits are identified in how DRM is brought into effect, e.g. though lack of planning and awareness. This, we argue, may be the golden opportunity to improve the national DRM-CCA integration. Past coastal risk mitigation and adaptation in Denmark only focused on structural measures. Due to a long coastline this is neither a sustainable nor an economically feasible solution ahead, and emphasis on non-structural measures is crucial. From qualitative research, we show that for the Danish case this should include: new policies, legislative changes, a higher degree of preparedness, and an improved awareness among stakeholders and civil society. The shift towards non-structural measures is hampered by lack in coordination that should be improved to agree e.g. on an acceptable risk definition and to avoid duplicating efforts. To advance awareness and coordination between DRM and CCA and to improve measures, a bottom-up approach could be initiated by civil society using recent flood events to exert pressure on the national government, and in a top-down approach the government could identify the needs among the civil society to include these in the decision-making process.

Keywords: climate change, disaster risk management, vulnerability, non-structural measures, acceptable risk, coordination, awareness

1. INTRODUCTION

Over the past years an increasing number of publications address the need to link disaster risk management (DRM) and climate change adaptation (CCA). This is not limited to scientific papers and international frameworks like the Hyogo and Sendai frameworks for Action (UN, 2005; UN, 2015) also emphasize on the creation of much stronger links between CCA and DRM and especially disaster risk reduction (DRR). It is widely accepted that the need for DRR and CCA support is most profound among vulnerable and poor populations in developing countries. However, history shows that highly developed and industrialized societies are impacted by catastrophic events, too. Examples are 2005 Hurricane Katrina (estimated loss US\$ 125 billion), 2011 Thai floods (est. loss US\$ 40-46 billion), and the 2011 Tohoku earthquake and tsunami (est. loss US\$ 210-375 billion) (Davis and Alexander, 2013). These large economic losses are mainly due to the interlinked vulnerability pattern found in developed countries. In addition, developing countries will often have responsive and adaptive capacities that are difficult to implement in industrialized countries. Industrialized societies thus also need to implement and integrate DRR and CCA.

Denmark's 7,300 km predominantly low-lying coastline will be highly impacted by climate change and increased flooding from a general rise in mean sea level and in extreme storm surge water levels potentially exceeding one meter by the end of this century (Grinsted et al., 2015; Jevrejeva et al., 2014). The hazard, vulnerability, and risk assessments performed as a part of implementation of the EU Floods Directive estimated a potential loss in the 10 appointed risk areas exceeding \$ 4 billion by 2100 (DCA, 2013). Here, as well in many of the world's coastal regions, future risks associated with storm surges must be understood to aid adaptation, management and sustainable development planning (Wong et al., 2014). Often adaptations to hazards are only implemented after a disaster has impacted an area (Jasanoff, 2010) and this is true for Denmark as well (Sorensen et al., 2010). Severe floods associated with the 5-6 December 2013 storm Xaver showed low levels of awareness and preparedness in the affected areas (Municipality of Roskilde, 2014). From a hazard perspective there is a need to focus on and improve CCA and DRM and especially DRR in Denmark, too.

2. DRM AND CCA IN A FLOOD RISK CONTEXT

Disaster risk management is by the IPCC (2012) understood as the: Processes for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of

increasing human security, well-being, quality of life and sustainable development”. Except for climate change being a slow on-set disaster the communalities are large. It is important that both DRM and CCA do not just involve designing projects or making lists with measures which can reduce potential impacts. In a state context it needs coordinated national and local initiatives and mitigating measures which will create ownership and increase awareness.

The mitigating and adaptive measures which should be used in an integrated approach to lower the risk of current and future flooding may be divided into four types: structural, semi-structural, non-structural and environmental (Davis and Alexander, 2013). Structural measures include engineered coastal protection (e.g. dikes, seawalls and breakwaters) as well as climate change adaptation initiatives when engineering new or retrofitting existing buildings ones, and the strengthening of infrastructure and critical infrastructure. Non-structural measures relate to organizational planning and preparedness and include disaster planning, warning systems, evacuation plans, business continuity planning, land use control, and the creation of awareness amongst the population. Semi-structural measures may be regarded as measures in which humans have to carry out actions involving risk reducing activity as a response. These include flood proofing where portable barriers can be used to limit flooding. Environmental measures relate to flood protection where elements in the nature are used to prevent flooding. In Denmark, these include sand nourishments to limit coastal erosion and the creation and reservation of flood storage areas.

3. DRR AND CCA IN DENMARK

It is well established that due to the close relationship between DRR and CCA they would improve from close coordination. Flood risk management in Denmark is in need of improved DRR and CCA and therefore also improved coordination. For instance, CCA is not mentioned in the Danish emergency legislation, and municipal flood risk preparedness and risk management plans in Denmark are developed in coastal regions without defining an acceptable risk for enforcement of implementing mitigation or adaptive measures. Qualitative research shows a strong need to improve the non-structural measures (Jebens et al., accepted). This includes:

- A) defining acceptable risks,
- B) improved coordination between stakeholders,
- C) changes in legislation and,
- D) an increase in awareness.

A: An acceptable risk has so far not been identified in any plans, and levels of protection do not reflect the different potential impacts along the Danish coastline. The protection efforts in the municipalities occur ad hoc and do not target the real threat, and will potentially transfer risks to neighbouring areas. In addition, coastal areas are under a high pressure to develop as a result of economic interests. Indecisiveness and uncertainty in decision-making does not lead to improved coordination.

B: Multiple initiatives seek to mitigate and adapt to flooding but there is a profound lack of coordination. This may partly be related to the governmental structure and system in Denmark where implementation of neo-liberal reforms has changed the relationship between the national government and the municipalities who are in charge of implementing measures. The national government only produces guidelines to the municipalities who must implement measures from a limited set of resources, knowledge and capacities (Sorensen and Jebens, 2015). In such a system more emerging problems are likely to receive more attention.

C: The failure to enforce legislation which requires relevant partners to reduce risks is often regarded as a root cause for many failures in risk management (Davis and Alexander, 2013). In Denmark, DRM and CCA only vaguely appear in legislation and, except for EU legislation in relation to the Floods Directive, no explicit links between DRM and CCA exist. In addition, current coastal protection legislation involves a process which is difficult for the civil society to understand.

D: There is low awareness in Denmark towards flooding and especially among the civil society. Hitherto, floods have been rare and of a limited extent rarely impacting entire communities or large groups of people. Recent events like Xaver clarify needs to raise awareness and preparedness across levels of governance.

4. IMPROVEMENTS NEEDED IN COORDINATION OF CCA AND DRM

Improvements for CCA are struggling to gain acceptance because climate change is a slow onset disaster in which the future is unknown. At the same time it may be perceived as a hindrance to economic development and therefore little attention is paid to the challenges by the current Danish administration. From a literature review Rivera (2014) defined a number of points of importance to improve links between CCA and DRR, which are also valid in a Danish context:

1. Understand CCA and DRR in a political context.
2. Use international and national plans, legislation and frameworks to improve DRM and CCA and the coordination between them. This includes revising plans, programs and activities.
3. Develop and evaluate programs and strengthening of capacity.

4. Stakeholders and government need to build cross-cutting partnerships and to: Influence decision making, improve monitoring system, and learn from experience.

Changes in legislation and creating frameworks will need to go hand in hand with more practical work to increase knowledge and awareness. One way to improve the link is to encourage stakeholders to move away from silo thinking which in the past has been identified between climate change adaption and disaster risk management. Evidence based policies are needed as well to inform governments on how to allocate their resources more strategically, and this could be supplemented by applying and integrate tools for DRR and CCA in order to manage the escalating threats. A number of proactive steps should therefore be followed to more easily deal with underlying factors: Collect crucial information to make informed decision making; Encourage governments to initiate the process by implementing small scale initiatives with specific goals so that progress can be monitored and measured; Include the civil society, where they should recognize their own role to increase the pressure on the government and decision-makers.

Due to the fact that coastal urban areas in Denmark and abroad concentrate economic activity and the majority of the population, the need to integrate CCA and DRM is particularly urgent in these areas. This increases the need to address risk management in urban planning since the vulnerabilities will increase.

4. ADDED VALUE FOR INTEGRATIVE RISK MANAGEMENT AND URBAN RESILIENCE

Denmark has together with many other countries agreed to implement the Hyogo Framework for Action. A review of the five priorities for action in a flood risk context reveal gaps which should be filled during the implementation of the Sendai Framework for Disaster Risk Reduction.

Actions for priority two are well established. The Danish Coastal Authority has made national screenings of the hazard, vulnerability and risk for coastal flooding to fulfill the EU Floods Directive, hereby appointing areas most in need to implement measures. In addition, early warnings are well established.

For the other priorities there is a need for improvement. The authors of the present paper find that there is a lack of coordination and awareness at all levels, a need for new legislation, and an urgent need for definitions of acceptable risk. These issues are all core elements of the priority actions one and three. The paper does not explicitly focus on the elements in priority actions four and five although Jebens et al. (2016) identify gaps in how underlying vulnerabilities are reduced and in preparedness planning.

Future work will therefore involve improvements on both DRM/DRR and CCA individually hereby giving rise to a golden opportunity to improve the coordination between them. Building on the EU Floods Directive there is also an opportunity to involve municipalities who are in daily contact with the civil society. This could lead to an increased awareness.

5. CONCLUSIONS

The opposite of creating vulnerability is to build capacity through a combination of DRM and CCA. In order to minimize flood impacts in the coastal zone of Denmark there is a need to define holistic and sustainable solutions to increase the capacity to adapt and mitigate the flood risk. Mainstreaming climate change adaptation and improved coordination with disaster risk management could create the foundation for this capacity increase and create awareness in the civil society in general. Development equally has to be incorporated into this process. Integration of DRM and CCA must be incorporated into local and national development policies and practices. Minor projects, where civil society can follow and engage in the process, may serve as a starting point.

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